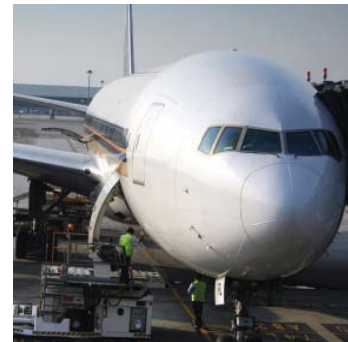




aerospace
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 process control
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PAR◇GEL™
 Water Removal Filter Elements



ENGINEERING YOUR SUCCESS.

PAR GELTM

Water Removal Filter Elements

Par-Gel filter elements are an effective tool in controlling water related problems in hydraulic power and lubrication systems.

There is more to proper fluid maintenance than just removing particulate matter. You need to remove water as well. Parker has developed Par-Gel water removal elements to be used in combination with particulate filters to provide significant benefits.

Less component wear, consequently less component generated contaminants.

Significant reduction of costly downtime and replacement of failed components.

Increased efficiency of the system, thereby improving machine productivity.

Less frequent replacement and disposal of contaminated fluid.

Reduced chance of catastrophic failure.

Water as a contaminant.

Whether you use a mineral-base or synthetic fluid, each will have a water saturation point. Above this point, the fluid cannot dissolve or hold any more water. This excessive water is referred to as 'free' or emulsified water. As little as .03% (300 ppm) by volume can saturate a hydraulic fluid.

Many mineral-base and synthetic fluids, unless specifically filtered or treated in some way, will contain levels of water above their saturation point.

Water is everywhere!

Storage and handling. Fluids are constantly exposed to water and water vapor while being handled and stored. For

instance, outdoor storage of tanks and drums is common. Water settles on top of tanks and drums and infiltrates the container, or is introduced when the container is opened to add or remove fluid.

In-service. Water can get by worn cylinder and actuator seals, or through reservoir openings. Water can come in contact with these entry points through water based cutting fluids or when water and/or steam are used for cleaning.



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Typical results of wear due to presence of particulate and water contamination.

Condensation is also a prime water source. As fluid cools in a reservoir, temperature drop condenses water vapor on inside surfaces, which in turn causes rust. Rust scale in the reservoir eventually becomes particulate contamination in the system.

Microbial growth as a contaminant.

Once water enters a system, growth of microorganisms begins. Since water is one of the end products of the breakdown of hydrocarbon fluid, once started, the process is somewhat self-sustaining.

Slime is evidence of microbial growth, as is the apparent increase in viscosity of the fluid, obnoxious odor and discolored fluid. The results are: short fluid life, degraded surface finish and rapid corrosion.

Water generated damage and operating problems

- Corrosion
- Accelerated abrasive wear
- Bearing fatigue
- Additive breakdown
- Increased acid level
- Viscosity variance
- Electrical conductivity

Forms of water in fluid

- Dissolved water– below saturation point.
- Free water–emulsified or in droplets*.

Water in the system creates oxides, slimes and resins. Corrosion is an obvious by-product and creates further contaminants in the system.

The effect is compounded, as you now have both particulate contaminant and water working together.

The particulate contamination can be as simple as rust flaking from reservoir walls. Anti-wear additives break down in the presence of water and form acids. The combination of water, heat and dissimilar metals encourages galvanic action. Pitted and corroded metal surfaces and finishes result.

Further complications occur as temperature drops and the fluid has less ability to hold water. As the freeze point is reached, ice crystals form, adversely affecting total system function. Operating functions may become slowed or erratic.

Electrical conductivity becomes a problem when water contamination weakens insulating properties of fluid (decreases dielectric kV strength).

Testing your fluid for water.

A simple 'crackle test' will tell you if there is water in your fluid. Simply take a metal dish or spoon with a small amount of fluid. Apply a flame under the container with a match. If bubbles rise and 'crackle' from the point of applied heat, you have free water.

ParTest™ fluid analysis. For complete analysis,



Parker offers Par-Test fluid analysis. Your Parker representative can supply you with a fluid container, mailing carton and appropriate forms to identify your fluid and its use. An independent lab performs complete spectrometric analysis, particle counts, viscosity and water content.

Results are sent directly to the requester.

* Excessive free water must be removed from the system before filtering is attempted. In systems with gross amounts of water (1% to 2% by volume), settling or vacuum dehydration should be considered before using Par-Gel filter elements.

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Removing water. Using a Par-Gel water removal element is an effective way of removing free water contamination from your hydraulic system. It is highly effective at removing free water from mineral-base and synthetic fluids.

The Par-Gel filter media is a highly absorbent copolymer laminate with an affinity for water. However, hydraulic or lubrication fluid passes freely through it. The water is bonded to the filter media and forever removed from the system. It cannot even be squeezed out.

Parker technology and



Photo above shows 'dry' Par-Gel filter media and the same media swollen with absorbed water.

expertise at your disposal.

Choosing the correct filters can save money and minimize problems caused by particulate and water contaminants in hydraulic and lubricating fluids.

Parker provides hard data and advice on choosing from a wide range of filter configurations, flow patterns and flow pressure capabilities.

How many filter elements will I need? Suppose you would like to remove water from contaminated oil stored in a 200 gallon tank. The tank is found to have 1000 ppm of water (very contaminated). The circulation rate will be 10 gpm for the 200 SUS fluid.

Example: How many single length Moduflow™ elements will be needed to reduce the water to normal saturation levels. To find the answer, use the conversion charts and capacity curves for the Moduflow element.

1. 1000ppm start - 300ppm finish = 700ppm removed
2. 700ppm water x .0001 = .07%
.07% x 200 gallons = .14 gallons water total
3. Use the capacity curve for Moduflow element P/N 927584. Capacity = 80cc at 200 SUS & 10 gpm to pressure drop of 25 psid. (See graph)
 $80\text{cc} \times 0.000264 \frac{\text{gal}}{\text{cc}} = 0.02 \text{ gallons/element}$
4. $\frac{0.14 \text{ gallons total water}}{0.02 \text{ gallons/element}} = 7 \text{ elements}^*$

*The replacement value of this fluid may range from \$600.00 to \$1400.00 (\$3 to \$7 gallon). At an estimated element cost of \$50.00 each, the savings realized would be from \$250.00 to \$1050.00!

Using Par-Gel filter elements saves money in fluid and replacement component costs. Also, the frequency of fluid disposal and the problems associated with it are greatly reduced.

Filter capacity. There are no accepted and approved water capacity testing or reporting standards. Consequently, there is virtually no way to compare one element capacity with another. It is also difficult to simulate a specific application in testing . . . making it hard to predict field performance.

Why the discrepancies? Water removal media capacity is the result of the interplay among four variables: flow rate, viscosity, bypass setting and the media itself.

Here's an example: two identical elements, testing the same fluid, varying only the flow rate.

This is a 15% reduction in capacity, due to changing only the flow rate! Now, look at what happens when the test flow rate is the same and the viscosity is changed.

	Element A	Element A'
Flow Rate:	3 gpm	10 gpm
Viscosity:	75 SUS	75 SUS
Test Capacity:	425 ml	360 ml

Twice the capacity can be achieved just by manipulating the test viscosity!

Naturally, having a lower bypass valve setting limits the capacity. Since the life

	Element B	Element B'
Flow Rate:	20 gpm	20 gpm
Viscosity:	200 SUS	75 SUS
Test Capacity:	250 ml	550 ml

of the element is measured in pressure drop, using higher bypass valve settings will increase apparent life (all other conditions equal).

We recommend 25 psid bypass valves to get adequate life from Par-Gel filter elements.

Capacity also depends on the media itself. That's why Parker spent two years researching the media used in Par-Gel filter elements. We tested all known media, and worked closely with our suppliers to achieve maximum water absorbency.

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How we report: Our goal is to give our customers usable data. Why show test results at a lower viscosity (65 SUS for example), if the typical application uses 200 SUS fluid? So, we report at 200 SUS to give typical field application capacity, and 75 SUS for competitive comparisons. But keep in mind when comparing, you still have to consider flowrate.

What it all means: You deserve to know how an element will work for you in your applications. So, we test and report our data in such a way that it helps you predict element performance and life.

Be wary of claims that say . . . “this element holds one quart (or one gallon) of water.” What was the test flow rate? fluid viscosity? bypass valve setting? Was it run as a ‘single pass’ or ‘multipass’ test?

Rely on Parker to give you the facts and data you need. Our goal is to better protect your systems and components . . . and we start up-front by telling you what you need to know. Is there any other way to do business?

Add it all up. Broad selection, competitive prices, off-the-shelf availability, on-time delivery, high-efficiency filter media, reduced system contaminant and longer component life. When you add it all up, we think you’ll agree...

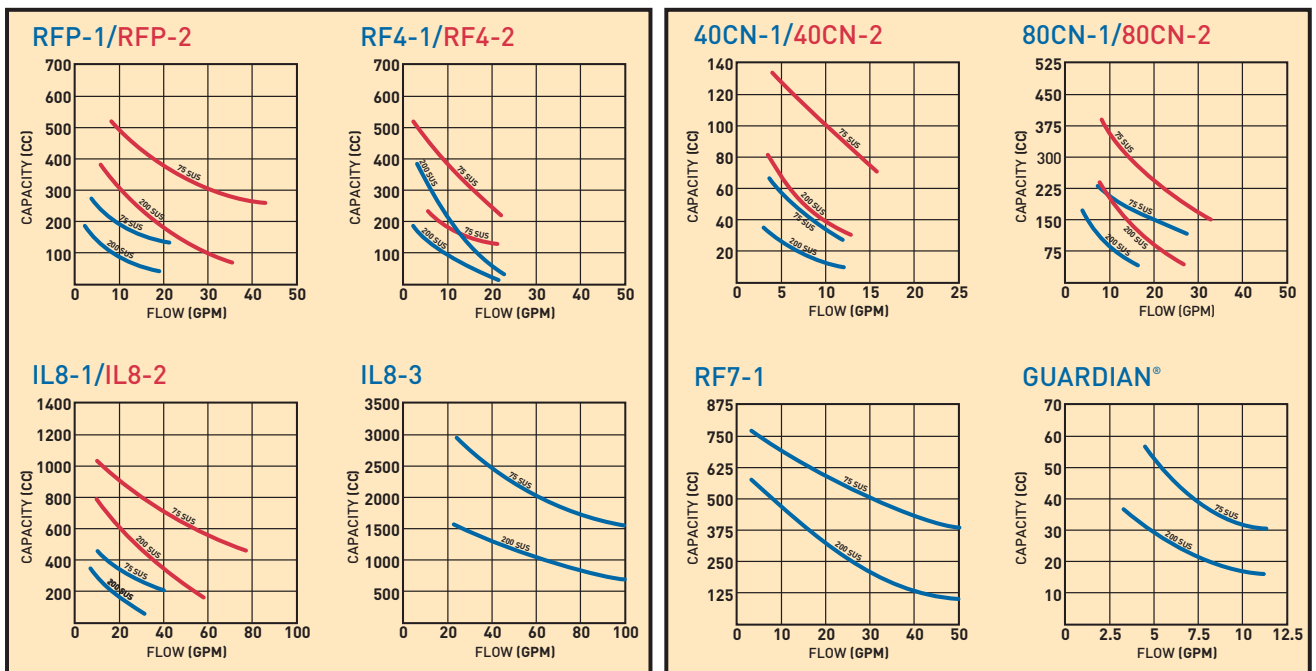
Conversion Factors

If you Have:	Multiply By:	To Get:
mg/l	0.00009	%
ppm	0.0001	%
ml	1.0	cc
cc	0.0338	fluid ounces
cc	0.00106	quarts
cc	0.000264	gallons

Typical Saturation Points

Fluid	PPM	%
Hydraulic	300	0.03%
Lubrication	400	0.04%
Transformer	50	0.005%

MULTI-PASS WATER CAPACITY



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Parker Par-Gel water removal filter elements are available in these standard Parker filter housings:

Filter Model Series	Length	Element Part Number
RFP-1	Single	927584
RFP-2	Double	927585
RF4-1	Single	930156
RF4-2	Double	928557
RF7-1	Single	933853
RF7-2	Double	932506
IL8-1	Single	929103
IL8-2	Double	929109
IL8-3	Triple	932006
40CN-1	Single	931412
40CN-2	Double	931414
80CN-1	Single	931416
80CN-2	Double	931418
Guardian®	Single	932019

Ideal applications for Par-Gel filter elements:



Guardian® Portable Filtration System



Filter Cart